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(54) REINFORCING COMPONENT, REPAIRED/REINFORCED STRUCTURAL BODY, PERMIATION DRAINAGE STRUCTUAL BODY AND PRODUCT FOR PERMIATION DRAINAGE USING THE SAME

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a reinforcing component which maintains high strength and superior permeation and drainage capability without being affected by the change of atmospheric temperatures and has an excellent permeation and adhesion to the base in repairing or reinforcing the surface of a concrete structure, and provide a repaired or reinforced structural body and a structural body for permeation drainage using the same.

SOLUTION: The reinforcing component comprises a resin compound consisting of an epoxy resin, polyester resin, polyurethane resin, and polyacrylic resin and a curing agent which reacts with and hardens the resin compound. Glass fibers and ceramic fibers are blended with at least either of the resin compound and the curing agent.

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

[0001]

[Field of the Invention] About the reinforcing agent which consists of resin base resin and a curing agent which reacts with this resin base resin and is stiffened, the various structures which applied this, and a secondary product, especially, this invention is used for civil works, such as pavement and a slope, and relates to the \*\*\*\*\* structure of achieving \*\* which was [ storm sewage ] excellent, and a wastewater function or its secondary product, and a pan at repair and reinforcement structure objects, such as the concrete structure.

[0002]

[Description of the Prior Art] Although \*\*\*\*\* structures, such as pavement which kneads liquid resin and the aggregate and covers with them until now, were seen, since viscosity was low, the pitch hung down the inside of structure under the effect of outside air temperature, the so-called topping phenomenon the adhesive strength of the upside aggregates falls and carries out [ the phenomenon ] polo polo lack as a result occurred, and liquid resin had the difficulty that a pitch collects on a pars basilaris ossis occipitalis, and a \*\*\*\*\* function deteriorates according to about [ that reinforcement is not maintained ] and a liquid sagging phenomenon.

[0003] In addition, although what put the reinforcing agent into liquid resin at the part was seen, viscosity became high unusually by the fall of outside air temperature, and it had left the problem on which workability is reduced.

[0004] On the other hand, although so-called water penetration concrete existed, it was a thing aiming at the percolation nature of water, and this did not achieve the \*\*\* function of water and was a lifting and a thing which differs in the purpose of use naturally about clogging frequently.

[0005] Then, the method of mixing rock wool with liquid resin and preventing a liquid sagging phenomenon is proposed conventionally.

[0006]

[Problem(s) to be Solved by the Invention] However, if rock wool is added, in case it will mix, when it mixes to extent which is in the inclination which fine-particles-izes and is thickened, and prevents a liquid sagging phenomenon, there is a problem that it becomes solid-state resin-like and the property as liquid resin cannot be employed efficiently.

[0007] Then, in order to solve such a problem, it becomes a front face from the aggregate of the fiber of the predetermined dimension which carried out adhesion covering of the liquid resin until it would be in a saturation state, and the fibrosis resin which elaborates in the shape of [ which both fiber laps in random and becomes entangled in a ream ] a paste by the adhesiveness of the liquid resin with which the aggregate of the fiber concerned covers each fiber front face, and is constituted is proposed (the patent No. 3209151 official report).

[0008] However, this fibrosis resin has the problem that the routing for manufacturing is very complicated.

[0009] Let it be a technical problem for this invention to offer the repair and the reinforcement structure object , the \*\*\*\*\* structure , and the \*\*\*\*\* secondary product which used it for the reinforcing agent list which was excellent in penetrating power and was excellent in the adhesion force with a substrate even if it could maintain high intensity nature and the outstanding \*\*\*\*\* function and was in repair and reinforcement of a concrete structure side ,without receive effect in change of outside air temperature in view of such a situation .

[0010]

[Means for Solving the Problem] The 1st mode of this invention which solves said technical problem is in the reinforcing agent characterized by coming to blend a glass fiber and ceramic fiber to either [ at least ] said resin base resin or said curing agent in the reinforcing agent which consists of resin base resin which consists of epoxy system resin, polyester system resin, polyurethane system resin, and acrylic resin, and a curing agent which reacts with this resin base resin and is stiffened.

[0011] The 2nd mode of this invention has said ceramic fiber in the reinforcing agent characterized by being the thing of an alumina, a silica, and a zirconia which uses a kind as a raw material at least in the 1st mode.

[0012] The 3rd mode of this invention has said glass fiber and said ceramic fiber in the reinforcing agent characterized by carrying out 3-10 weight section combination to said resin base resin 100 weight section in the mode of the 1st or 2.

[0013] The 4th mode of this invention has said glass fiber and said ceramic fiber in the reinforcing agent characterized by carrying out 3-10 weight section combination to said curing agent 100 weight section in the mode of the 1st or 2.

[0014] the 5th mode of this invention -- which 1-4th voice -- it sets like and the compounding ratio of said glass fiber and said ceramic fiber is in the reinforcing agent characterized by being in the range of 3:7-7:3 by the weight ratio.

[0015] The 6th mode of this invention has said resin base resin and said curing agent in the reinforcing agent characterized by being blended in 6:4-8:2 by the weight ratio in which 1-5th modes.

[0016] the 7th mode of this invention -- which 1-6th voice -- it sets like and is in the reinforcing agent characterized by containing at least a kind of additive chosen as either [ at least ] said resin base resin or said curing agent from a coloring agent, antiseptics, an antifungal agent, a rust-proofer, an ant prevention agent, an antimicrobial agent, and a seaweed-proofing agent.

[0017] the 8th mode of this invention -- which 1-7th voice -- a reinforcing agent [ like ] is mixed and stirred and it is in the repair and the reinforcement structure object characterized by having applied to repair or a reinforcement structure object, and solidifying it.

[0018] In the 8th mode, the 9th mode of this invention blends the aggregate with said reinforcing agent, and is in the repair and the reinforcement structure object characterized by having applied to repair or a reinforcement structure object, and solidifying it.

[0019] The 10th mode of this invention has said repair or a reinforcement structure object in the repair and the reinforcement structure object characterized by being what chosen from a concrete system or the woody system structure, concrete system non-\*\*\*\*\*\*, an outer wall, and a roof in the mode of the 8th or 9.

[0020] The 11th mode of this invention is in the \*\*\*\*\* structure which blends the aggregate with the reinforcing agent of which 1-7th modes, mixes and stirs, and is characterized by having covered and making it solidify.

[0021] The 12th mode of this invention is in the \*\*\*\*\* structure characterized by having covered pavement or a slope with said reinforcing agent, and making it solidify it in the 11th mode.

[0022] the 13th mode of this invention -- which 1-7th voice -- the aggregate is blended with a reinforcing agent [ like ], and it stirs, it slushes into shattering after that, and is in the \*\*\*\*\* secondary product characterized by mixing and coming to unmold after care-of-health solidification.

[0023] The 14th mode of this invention is in the \*\*\*\*\* secondary product characterized by being the block for gutters, or a tabular block in the 13th mode.

[0024] Hereafter, the configuration of this invention is further explained to a detail.

[0025] The reinforcing agent of this invention is liquid resin of 2 acidity or alkalinity which consists of resin base resin and a curing agent, and comes to blend a glass fiber and ceramic fiber to either [ at least ] resin base resin or a curing agent.

[0026] As resin base resin, resin base resin and a curing agent can mention epoxy system resin, polyester system resin, polyurethane system resin, acrylic resin, etc., and especially its epoxy resin and polyurethane resin are [ that what is necessary is just to use a well-known thing from the former ] desirable. Moreover, a curing agent can mention an amine system curing agent that what is necessary is just what reacts with this resin base resin and is stiffened.

[0027] The reinforcing agent of this invention comes to blend a glass fiber and ceramic fiber to either [ at least ] resin base resin or a curing agent.

[0028] In addition, it is desirable to choose the class of curing agent suitably according to an application. For example, in order to raise adhesion with a substrate for the application for repair / reinforcement of a wall surface etc., although the cure rate used for the application of infusion etc. is slow, it is desirable to use the high (for it to be hypoviscosity generally) curing agent of permeability. Moreover, it is more desirable to use a curing agent with a quick cure rate rather than permeability is excellent in the case of \*\*\*\*\* structural steel workers, such as pavement.

[0029] Here, mean fiber length uses an about 3mm thing preferably about 2-7mm that a glass fiber should just be what is used for this application from the former.

[0030] Moreover, by using a glass fiber together, ceramic fiber prevents liquid sagging while demonstrating the reinforcement effectiveness conjointly in multiplication with the reinforcement effectiveness of a glass fiber. That is, ceramic fiber gets twisted around a glass fiber, and demonstrates the reinforcement effectiveness and the liquid sagging prevention effectiveness.

[0031] Fiber made [ that what is necessary is just fiber made from a kind at least chosen from an alumina, a silica, a zirconia, etc. as ceramic fiber ] from fiber made from an alumina and a silica, the alumina, the silica, and the zirconia etc. can be mentioned. The fiber length of this ceramic fiber is shorter than a glass fiber, and is dozens of micrometers - about hundreds of micrometers preferably 1mm or less. SC bulk (trade name: new Chemical Society of Japan thermal ceramic company make) which is fiber specifically made from fiber made from an alumina and a silica or an alumina, a

silica, and a zirconia can be mentioned.

[0032] As for such a glass fiber and ceramic fiber, it is desirable the range of 3:7-7:3 and to mix by 5:5-7:3 preferably and to use by the weight ratio. It is because the reinforcement effectiveness and the liquid sagging prevention effectiveness by the synergistic effect will not be notably demonstrated if it separates from this range.

[0033] In addition, as for a glass fiber and ceramic fiber, it is desirable to blend with resin base resin with much amount used as compared with a curing agent. It is good 3 - 10 weight section and for the blending ratio of coal to consider as 3 - 7 weight section preferably to the resin base resin 100 weight section. It is because viscosity will be too high and workability will fall, if the effectiveness mentioned above when fewer than this amount is not demonstrated notably but there is than this. [ more ]

[0034] Of course, a glass fiber and ceramic fiber may be blended with a curing agent, and may be blended with both. When blending with a curing agent, it is desirable to carry out 3-10 weight section combination to the curing agent 100 weight section. In addition, generally curing agent 40 weight section extent is used to the resin base resin 100 weight section, blending.

[0035] In addition, in addition to a glass fiber and ceramic fiber, organic fiber, such as inorganic fibers, such as other fiber, for example, rock wool etc., coconut fiber, and polyester resin fiber, may be added.

[0036] Moreover, the additive with the reinforcing agent of this invention well-known from the former, such as a coloring agent, antiseptics, an antifungal agent, a rust-proofer, an ant prevention agent, an antimicrobial agent, and a seaweed-proofing agent, may be blended.

[0037] According to an application, the reinforcing agent of this invention mixes only resin base resin and a curing agent, or blends and uses the aggregate for this.

[0038] Generally the mixed rate of resin base resin and a curing agent is blended in 6:4-8:2 by the weight ratio.

[0039] Moreover, as the aggregate, things generally used, such as sand, a pea gravel, a crushed stone, a rubber chip, a shell, a piece of wood, a glass caret, incinerated ash, and aluminum dross, can be used.

[0040] For example, when performing repair of the concrete structure, for example, the wall of a building etc., and reinforcement, the aggregate with a comparatively small particle size is blended, and it is made to apply and harden, without using the aggregate, after stirring, mixing and. Thereby, repair of the concrete structure and reinforcement are completed.

[0041] When the reinforcing agent of this invention is used, liquid sagging is prevented according to the synergistic effect by having blended a glass fiber and ceramic fiber, and the reinforcement effectiveness is also high.

[0042] Moreover, it is desirable to use the curing agent of hypoviscosity for such an application comparatively. Thereby, the permeability to a substrate increases and the adhesion force with a substrate improves.

[0043] On the other hand, in order to form \*\*\*\*\* structures, such as pavement and slope protection, after blending the aggregates, such as a pea gravel, with the reinforcing agent of this invention and mixing and stirring, care-of-health solidification is covered and carried out.

[0044] Also in this case, the effectiveness that the reinforcement effectiveness is higher than the case where liquid sagging was prevented as having used rock wool more than the EQC, and rock wool is used according to the synergistic effect by having blended a glass fiber and ceramic fiber is done so.

[0045] Moreover, similarly, the aggregate can be blended with the reinforcing agent of this invention, it can mix and stir, and \*\*\*\*\* secondary products, such as a block for gutters and a tabular block, can be obtained by slushing into shuttering after that and unmolding after care-of-health solidification.

[0046] Also in this case, the ununiformity of quality is prevented by liquid sagging and the secondary product of high intensity can be obtained.

[0047] The organization cross section of the \*\*\*\*\* structure of this invention is shown in drawing 1. That is, since the fibrous piece 3 which consists of a glass fiber and ceramic fiber is mixed in the hardening resin 2 which exists between the aggregates 1 as shown in drawing 1, the pea gravel which is the aggregate 1 becomes entangled mutually, and is stabilized, firm nature is really [ of the structure ] brought about, and a liquid sagging phenomenon is not seen.

[0048] On the other hand, as elegance is shown in drawing 2 R>2, the debt by the aggregate 11 and hardening resin 12 is not uniform, it is in an unstable condition according to a liquid sagging phenomenon and the phenomenon in which it does not harden, and hardening resin 12 will be conventionally [ which does not add a fibrous piece ] unevenly distributed caudad.

[0049]

[Embodiment of the Invention] Hereafter, this invention is explained based on an example.

[0050] (Example 1) 50g (new Japan theory-of-heat company make) of glass fibers of about 3mm length and alumina / silica system ceramic fiber SC bulk 1260 (trade name: new Chemical Society of Japan thermal ceramic company make) 25g were blended and stirred to bisphenol A type epoxy resin EP-4520S (trade name: by Asahi Denka Kogyo K.K. viscosity 10 dPa-s / 25 degrees C) 2.5kg, and it considered as resin base resin.

[0051] To this resin base resin, denaturation aliphatic series polyamine system curing agent EH-270B(trade name:; by Asahi Denka Kogyo K.K. viscosity 0.5 dPa-s / 25 degrees C)1kg with a slow cure rate and high permeability was blended, mixed stirring was carried out, and it considered as the reinforcing agent.

[0052] The concrete block was made to apply and harden this with the brush, and the reinforcement structure object was acquired. The dimension of this concrete block was 2 width of face of 120mm, height of 150mm, die length of 600mm, and the cross section of 18000mm.

[0053] This reinforcement structure object had strong adhesion to the substrate. When the structure was destroyed and observed, it had permeated 1-3mm to the substrate.

[0054] (Example 2) 50g (new Japan theory-of-heat company make) of glass fibers of about 3mm length and alumina / silica system ceramic fiber SC bulk 1260 (trade name: new Chemical Society of Japan thermal ceramic company make) 25g were blended and stirred to bisphenol A type epoxy resin EP-4520S (trade name:; by Asahi Denka Kogyo K.K. viscosity 10 dPa-s / 25 degrees C)2.5kg, and it considered as resin base resin.

[0055] To this resin base resin, denaturation aliphatic series polyamine system curing agent EH-233B(trade name:; by Asahi Denka Kogyo K.K. viscosity 3 dPa-s / 25 degrees C)1kg with a quick cure rate and low permeability was blended, mixed stirring was carried out, and it considered as the reinforcing agent.

[0056] The concrete block was made to apply and harden this with the brush, and the reinforcement structure object was acquired. Although this reinforcement structure object was somewhat inferior in adhesion with a substrate as compared with the example 1, it formed the reinforcement structure without a liquid sagging phenomenon. In addition, the substrate was permeated 0.5-1mm.

[0057] (Example 3) 500g (new Japan theory-of-heat company make) of glass fibers and alumina / silica system ceramic fiber SC bulk 1260 (trade name: new Chemical Society of Japan thermal ceramic company make) 220g were blended and stirred to bisphenol A type epoxy resin EP-4520S (trade name:; by Asahi Denka Kogyo K.K. viscosity 10 dPa-s / 25 degrees C)18kg, and it considered as resin base resin.

[0058] Moreover, denaturation aliphatic series polyamine system curing agent EH-270B (trade name:; by Asahi Denka Kogyo K.K. viscosity 3 dPa-s / 25 degrees C) is prepared as a curing agent.

[0059] 30kg of pea gravels was supplied to the concrete mixer as the aggregate, the 1.2kg of the above-mentioned resin base resin and 480g of said curing agents were blended and kneaded, the road was covered, it was recuperated and \*\*\*\*\* structure was formed.

[0060] When \*\*\*\*\* structure was observed, the liquid sagging condition was not observed.

[0061] (Example 4) After blending the same reinforcing agent as an example 3 like the aggregate and kneading it, it slushed into shattering and point pressure was applied, it checked, and it was recuperated and hardening was used as the secondary-forming article.

[0062] When this secondary-forming article was observed, the liquid sagging condition was not observed.

[0063] (Example 1 of a comparison) The reinforcing agent was prepared like the example 1 except having used rock wool instead of ceramic fiber.

[0064] The concrete block was made to apply and harden this reinforcing agent with the brush, and the reinforcement structure object was acquired.

[0065] (Example 2 of a comparison) It was made to be the same as that of an example 3 except not containing a glass fiber and ceramic fiber. When the secondary-forming article was manufactured now, liquid sagging structure as shown in drawing 2 was observed.

[0066] (Example of a trial) About the concrete block which the example 1 and the example 1 of a comparison reinforced, it is JIS. Flexural strength was measured based on A1106. This result is shown in Table 1.

[0067] Consequently, it turned out that the direction of the reinforcement structure of an example 1 is high intensity about 20% from the example 1 of a comparison.

[0068]

[Table 1]

	重量 (g)	見かけ密度 (kg/m <sup>3</sup> )	最大荷重 (kN)	強度 (N/mm <sup>2</sup> )
実施例 1	2 5 7 9 3	2 3 8 8	3 9. 9	8. 3 1
比較例 1	2 5 3 6 6	2 3 4 9	3 3. 3	6. 9 4

[0069]

[Effect of the Invention] Without receiving effect in change of outside air temperature according to this invention, as explained above, the reinforcing agent which maintains high intensity nature and the outstanding \*\*\*\*\* function can

be offered, the \*\*\*\*\* structure which was [ slope protection / repair and reinforcement structures, such as a wall surface, pavement ] excellent is used for the \*\*\*\*\* secondary product which was [ block / finishing and the block for gutters, / tabular ] excellent, and it is suitable.

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CLAIMS

## [Claim(s)]

[Claim 1] The reinforcing agent characterized by coming to blend a glass fiber and ceramic fiber to either [ at least ] said resin base resin or said curing agent in the reinforcing agent which consists of resin base resin which consists of epoxy system resin, polyester system resin, polyurethane system resin, and acrylic resin, and a curing agent which reacts with this resin base resin and is stiffened.

[Claim 2] The reinforcing agent to which said ceramic fiber is characterized by being the thing of an alumina, a silica, and a zirconia which uses a kind as a raw material at least in claim 1.

[Claim 3] The reinforcing agent to which said glass fiber and said ceramic fiber are characterized by carrying out 3-10 weight section combination to said resin base resin 100 weight section in claim 1 or 2.

[Claim 4] The reinforcing agent to which said glass fiber and said ceramic fiber are characterized by carrying out 3-10 weight section combination to said curing agent 100 weight section in claim 1 or 2.

[Claim 5] The reinforcing agent characterized by setting they being [ any of claims 1-4 ], and the compounding ratio of said glass fiber and said ceramic fiber being in the range of 3:7-7:3 by the weight ratio.

[Claim 6] The reinforcing agent characterized by setting they being [ any of claims 1-5 ], and blending said resin base resin and said curing agent in 6:4-8:2 by the weight ratio.

[Claim 7] The reinforcing agent characterized by setting they being [ any of claims 1-6 ], and containing at least a kind of additive chosen as either [ at least ] said resin base resin or said curing agent from a coloring agent, antiseptics, an antifungal agent, a rust-proofer, an ant prevention agent, an antimicrobial agent, and a seaweed-proofing agent.

[Claim 8] The repair and the reinforcement structure object which mixes and stirs which reinforcing agent of claims 1-7, applies to repair or a reinforcement structure object, and is characterized by making it solidify.

[Claim 9] The repair and the reinforcement structure object which blends the aggregate with said reinforcing agent, applies to repair or a reinforcement structure object, and is characterized by making it solidify in claim 8.

[Claim 10] The repair and the reinforcement structure object characterized by said repair or a reinforcement structure object being what chosen from a concrete system or the woody system structure, concrete system non-\*\*\*\*\*\*, an outer wall, and a roof in claim 8 or 9.

[Claim 11] \*\*\*\*\* structure which blends the aggregate with which reinforcing agent of claims 1-7, mixes and stirs, and is characterized by having covered and making it solidify.

[Claim 12] \*\*\*\*\* structure characterized by having covered pavement or a slope with said reinforcing agent, and making it solidify it in claim 11.

[Claim 13] The \*\*\*\*\* secondary product which blends the aggregate with which reinforcing agent of claims 1-7, and is characterized by mixing and stirring, slushing into shuttering after that and coming to unmold after care-of-health solidification.

[Claim 14] The \*\*\*\*\* secondary product characterized by being the block for gutters, or a tabular block in claim 13.

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